Coal Combustion Products

Demonstration No. 1: U.S. 12 in Lake County, (1994).

Type of work: Embankment widening (290 ft long x 20 ft wide x 12 ft high)

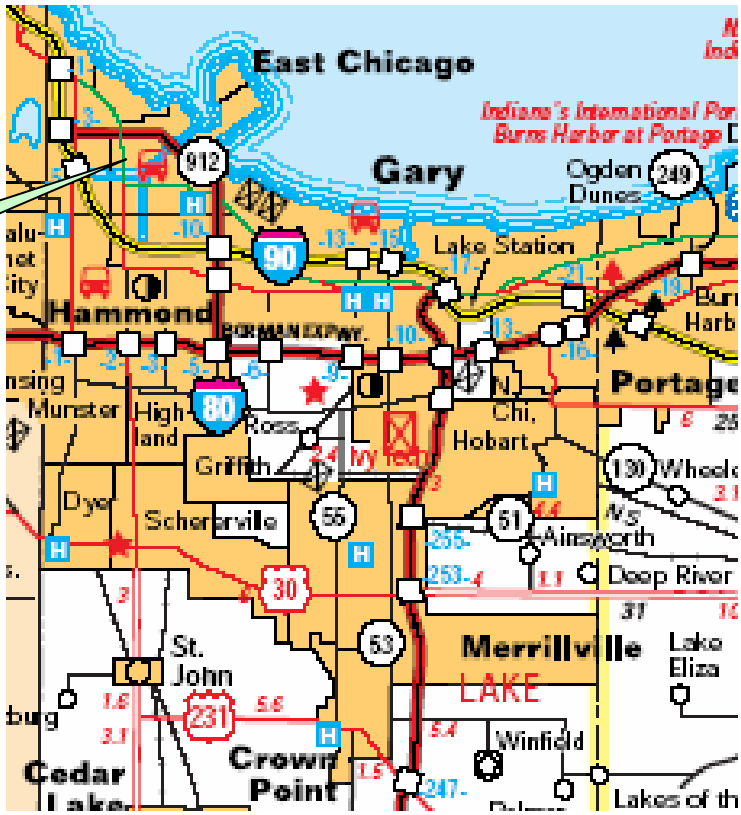
Type of materials used Bottom Ash (5,000 yd³)

Coal Ash Producer Shaeffer (NIPSCO)

No environmental monitoring

Based on recent observation – No slope failure or settlement

Location of Project, U.S. 12 in Lake County



South Slope (CCBP) between RR & Kennedy Ave.

US12/20 in Lake County (2002)

Demonstration No. 2: 56th Street over I-465 in Marion Co. (1995)

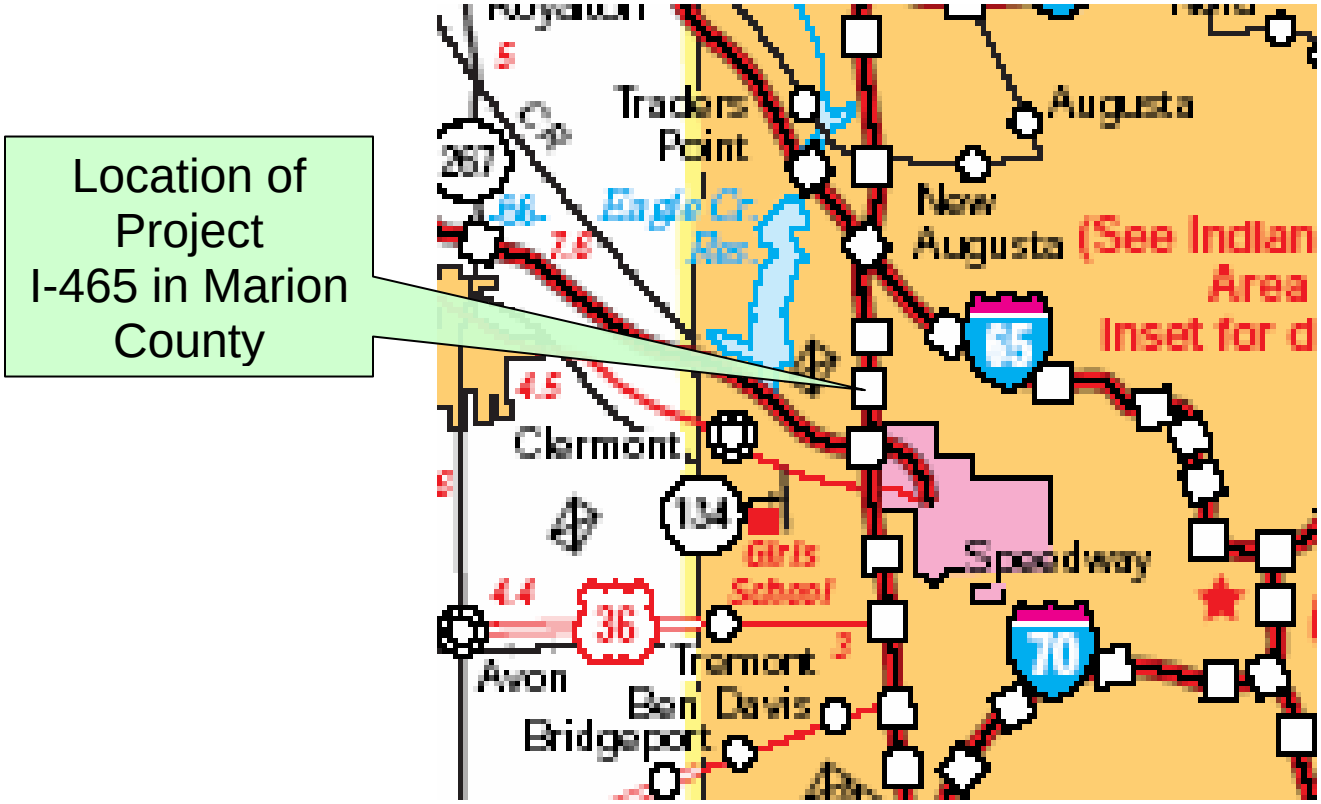
Type of work: Embankment widening (1300 ft long by 15 ft high)

Coal Ash producer: IPL

Type of Material used: Bottom ash and fly ash mixture (40% ≤ No. 200 Sieve), 10,000 yd³

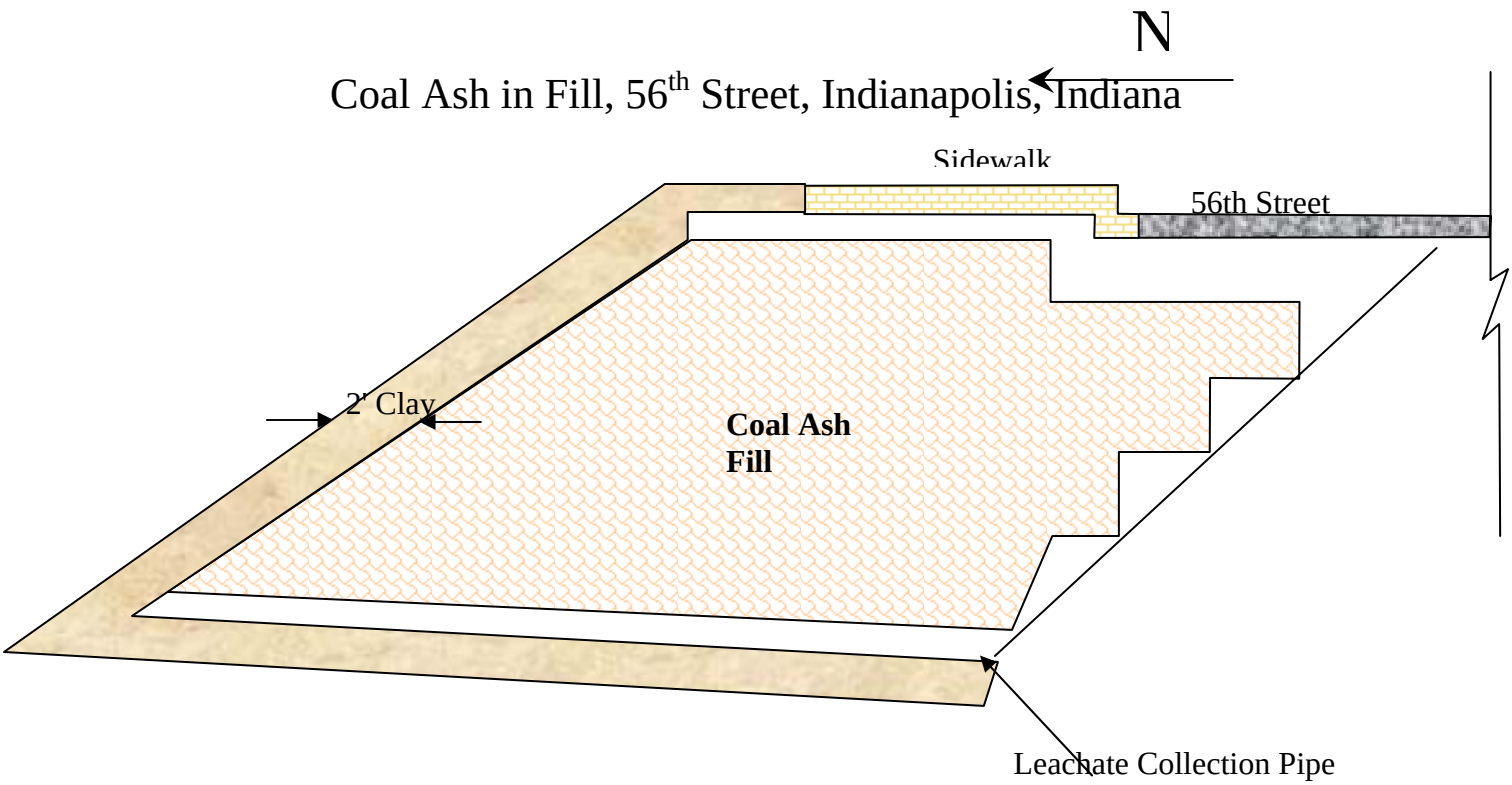
Geotechnical monitoring: Settlement of 1.4 inches to 2.2 inches

Environmental monitoring: Boron was higher, but less than drinking water limits



Project Feature, Engineering Properties and Compaction Requirements of Embankment at U.S. 12, in Lake County (1994)

Project Features	
Embankment Length	290 ft.
Fill Height	12 ft.
Proposed Slope	2H:1V
Foundation Soils	Sand
Existing Embankment Soil	Sand
Fill Material Used	Bottom Ash
Quantity Used	5000 yd3 (approx.)
Engineering Properties	
AASHTO Classification	A-1-a
Passing # 200 Sieve	1%
Maximum Dry Density	92 pcf
Specific Gravity (AASHTO T-100)	2.37 ~ 2.47
Hydraulic Conductivity (AASHTO T-215)	3.3x10-3 ft/sec
Friction Angle (AASHTO T-236)	35° to 45°
CBR (AASHTO T-193)	45 ~ 70
Compaction Requirements	
% Compaction	95% of Standard Proctor
Moisture Content	Drier of OMC
Lift Thickness	6 inches
Roller Passes	6 passes with a Vibratory Roller (10 T)


N
Coal Ash in Fill, 56th Street, Indianapolis, Indiana
Sidewalk
56th Street
2' Clay
Coal Ash
Fill
Leachate Collection Pipe

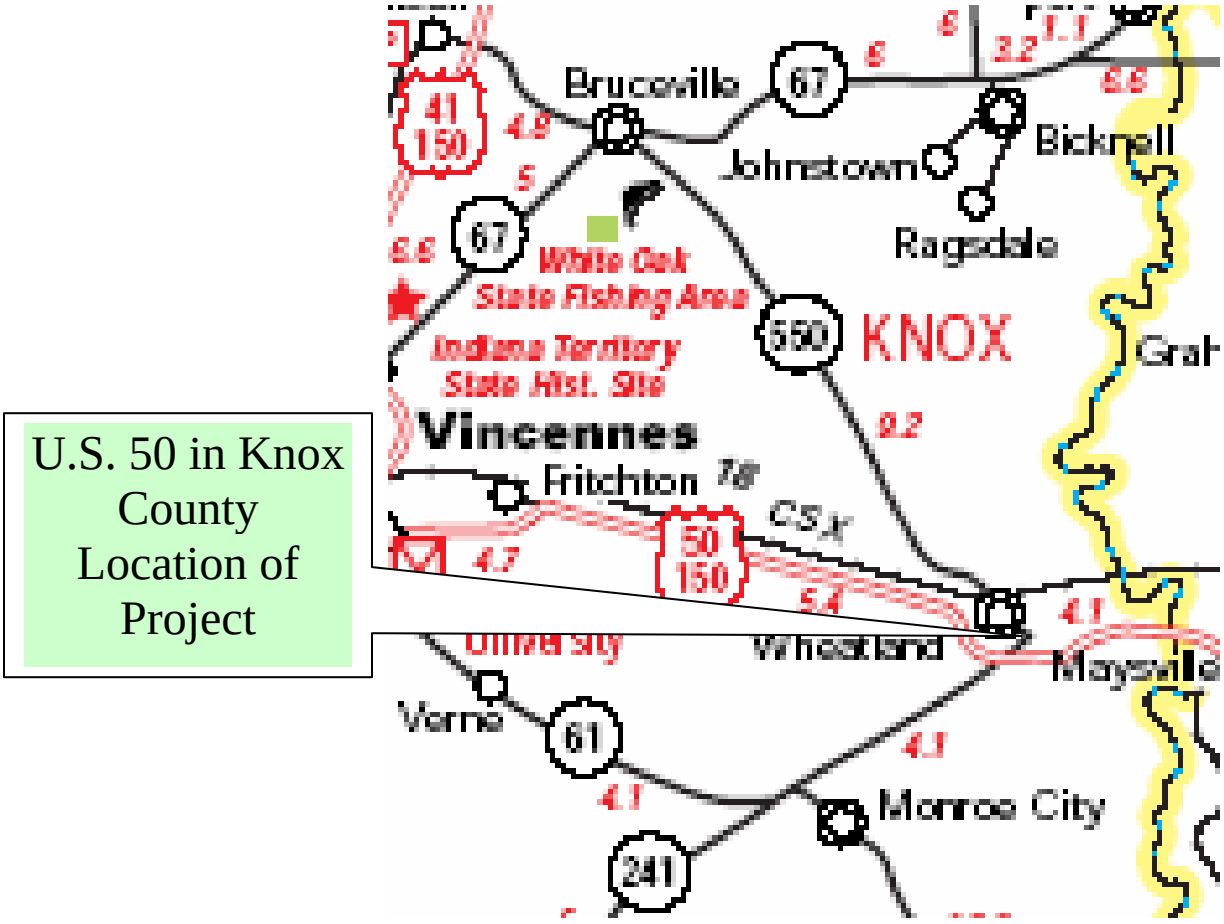
Demonstration No. 3: U.S. 50 in Knox County (1996)

Type of work: New roadway construction (1200 ft long 2-lane highway)

Coal Ash Producer: Gibson Power Plant (Cinergy) Vol = 45,000 yd^3 (Approx.)

Type of material used: Bottom ash and fly ash (40% ≤ No. 200 Sieve)

Environmental monitoring: No potential impact on groundwater were indicated (2000)



Project Feature, Engineering Properties and Compaction Requirements of Embankment at U.S. 50, in Knox County (1996)

Project Features – Four Lanes with Median (new alignment)	
Length of Roadway	1200 feet
Fill Height	< 10 ft.
Embankment Slope	3H:1V
Foundation Soil	A-6, A-7-6
Engineering Properties of Co-Mingled Ash	
Passing #200 Sieve	25% (Approx.)
Specific Gravity (AASHTO T-100)	2.60
Maximum Dry Density (AASHTO T-99)	116 (Pcf)
OMC	11.3%
Friction Angle (AASHTO T-236)	35°
Hydraulic Conductivity (AASHTO T-215)	6.6 x 10-5 ft/sec
Compaction Requirements	
Lift Thickness	6 inches
Compaction	95% of Standard Proctor
Moisture Content	-3 of OMC
Roller Passes (Static)	5

Post-Construction U.S. 50 in Knox County

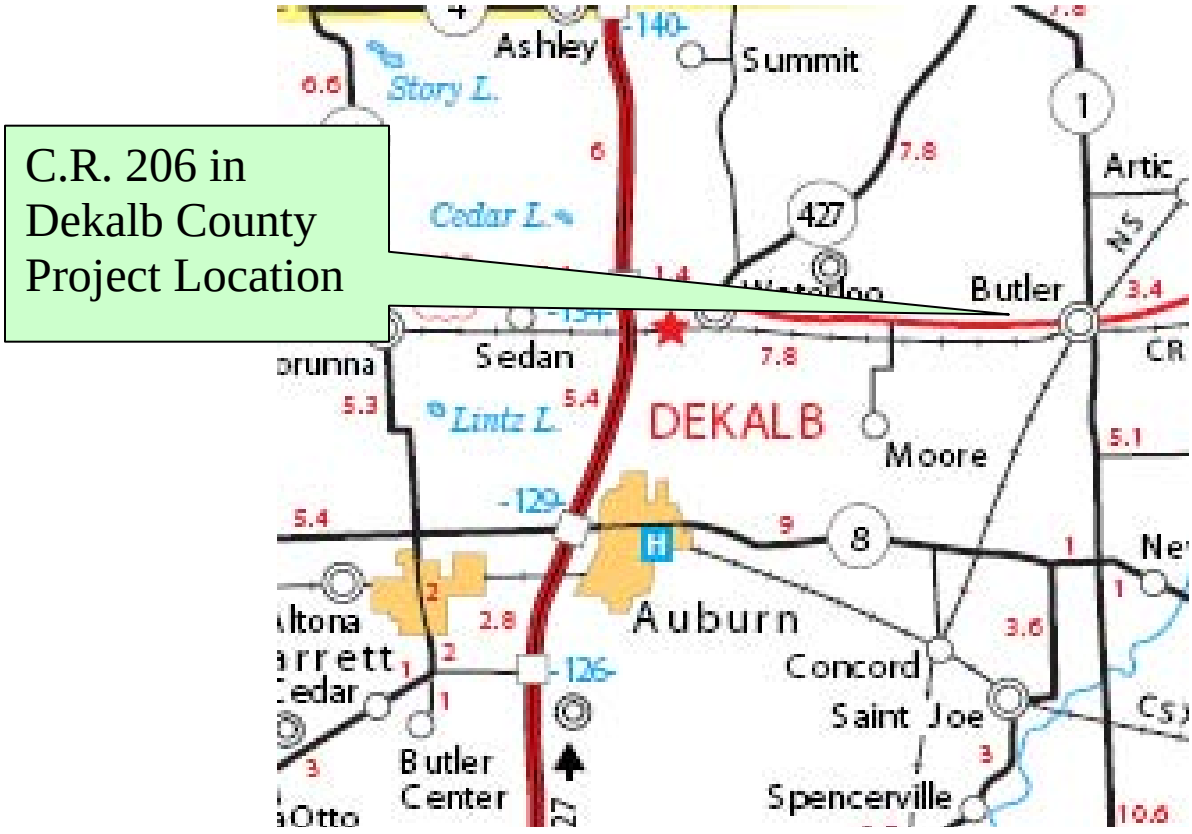
Demonstration No. 4: Embankment Construction on C.R. 206 in Dekalb County (1996)

Type of work: New roadway construction (374 ft long x 280 ft wide x 30 ft high)

Foundry Sand Producer: Auburn Foundry Vol = 56,000 yd³

Geotechnical monitoring: Very small settlement

Environmental monitoring: No concern



Embankment Construction on C.R. 206 in Dekalb County

Test		Weathered WFS	Fresh WFS
Direct Shear (AASHTO)	Cohesive intercept	83.4 pcf (13.1 kN/m^2)	96.8 pcf (15.2 kN/m^2)
	Friction Angle	38^o	39^o
CBR (AASHTO 193)	CBR	16.8	6.2
Hydraulic conductivity (ASTM D1883, D5084)	Falling head, fixed wall	4.6 x 10^{-6} ft/s (1.4 x 10^{-6} m/s)	5.6 x 10^{-6} ft/s (1.8 x 10^{-7} m/s)
Liquid Limit (ASTM D4318)		30.7%	--
Plastic Limit (ASTM D4318)		24.7%	NP
Specific Gravity (ASTM D854)		2.53	2.46
Percentage of coarse particles (ASTM D422)		78 – 90%	60%
Percentage of fines (Passing No. 200 Sieve)		10 – 22%	40%
Percentage of clay size particles (>0.005 mm) (ASTM D422)		-%	--
Standard Proctor Compaction method B (ASTM D698)	12.8	12.8	27.1
	Maximum dry unit wt (Kn/m^3)	18.2	--

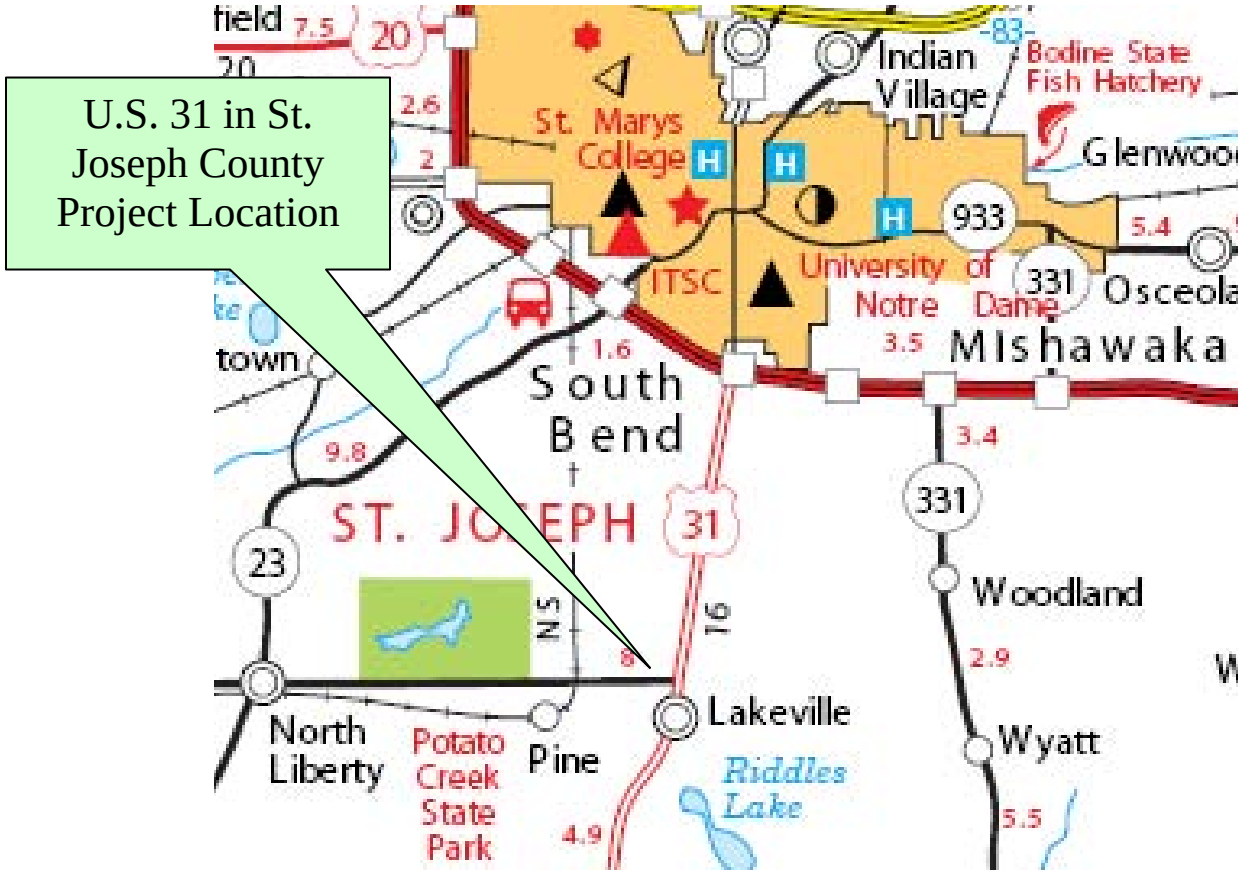
Demonstration No. 5: Embankment construction using Shredded Tires and Granular Mix on U.S. 31 in St. Joseph County (2001)

Type of work: Road embankment (65 ft long x 100 ft wide by 10 ft high)

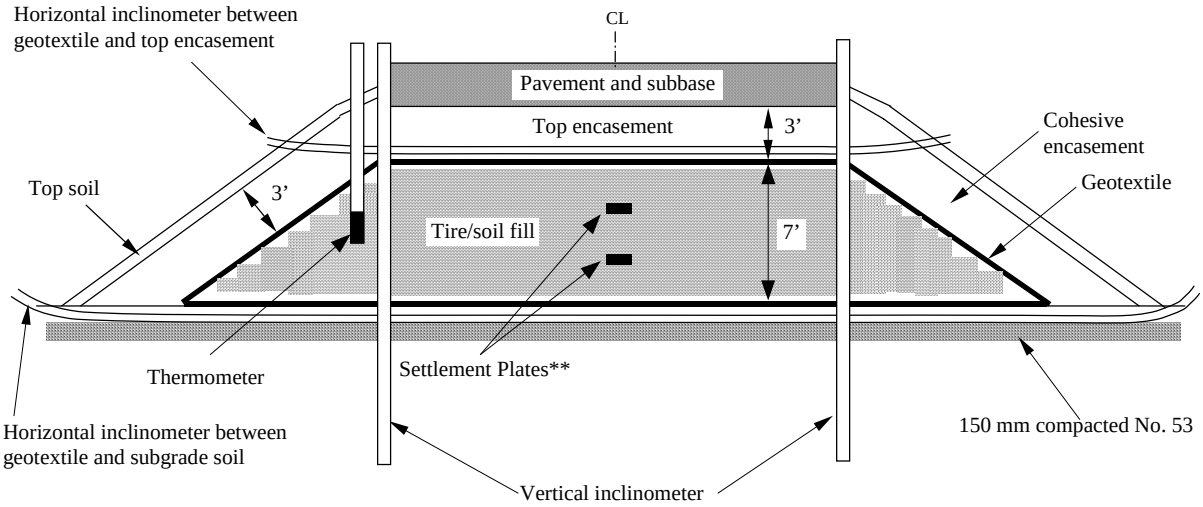
Tire Shred producer: Dillion Tires (Qty 800 yd³)

Geotechnical monitoring: 13 mm Settlement

Environmental monitoring: Exothermic reaction – not observed



Instrumentation of Tire Shreds Embankment (at middle section)



*Note: - *Monitoring Well should be installed within 20 ft from the toe of embankment.*
- *Vertical and horizontal inclinometers are installed at 1-m distance longitudinally.*

** - *Settlement plates: top, middle, and bottom of tire shreds fill at 1.0 m apart longitudinally (installed by contractor)*

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Tire Chips and Sand Mixture

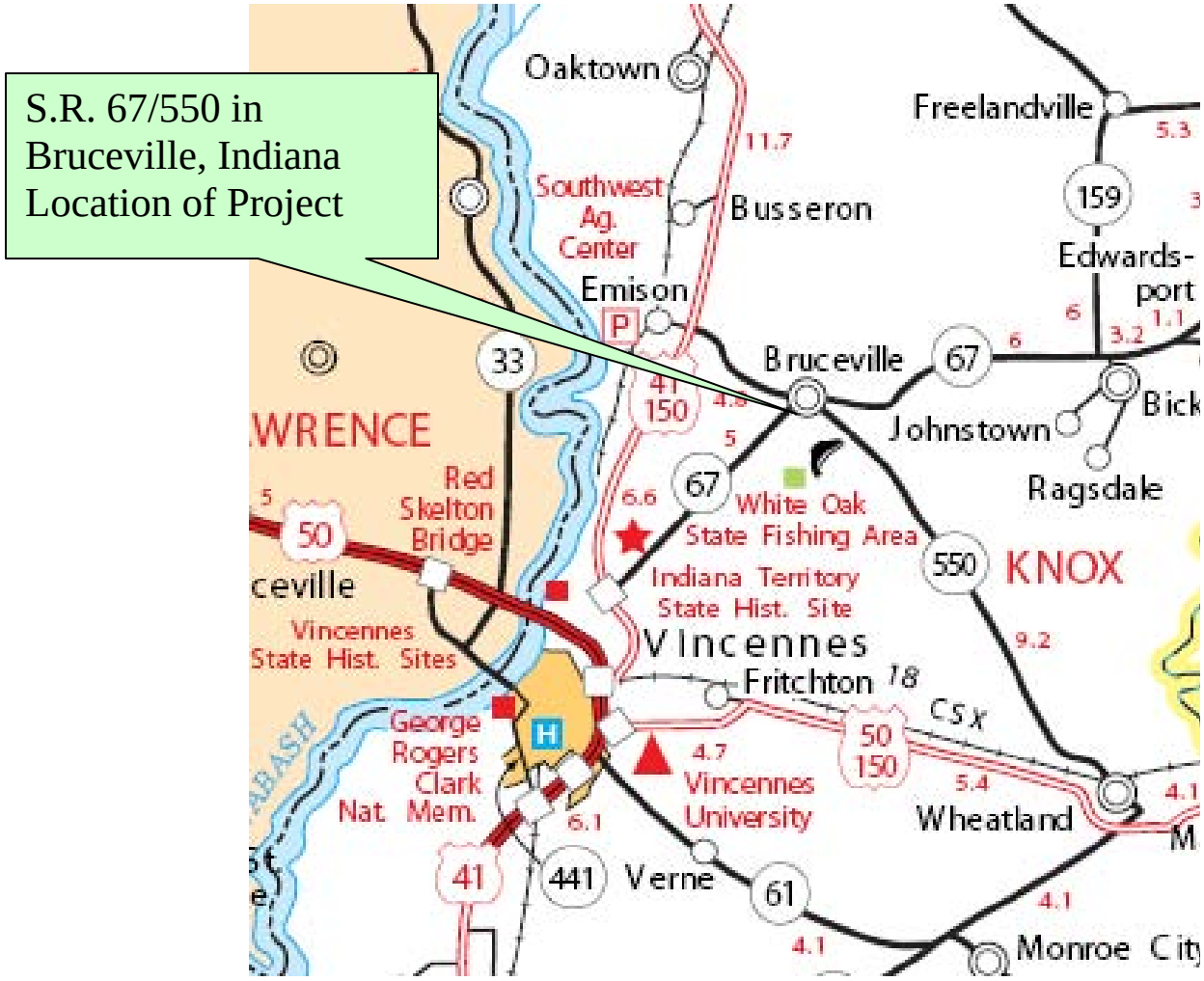
Construction Phase of Tire Shred Project

Completed Project, U.S. 31 in St. Joseph County

Demonstration No. 6: Crushed Glass as backfill in Bruceville, IN, Knox County (2001)

Material used: Crushed glass (meets requirements of State for backfill)

Quantity of Crushed glass: 20 yd³




WP 1550

Demonstration No. 7: Use of High Volume Fly Ash on S.R. 641 in Vigo County (2005)

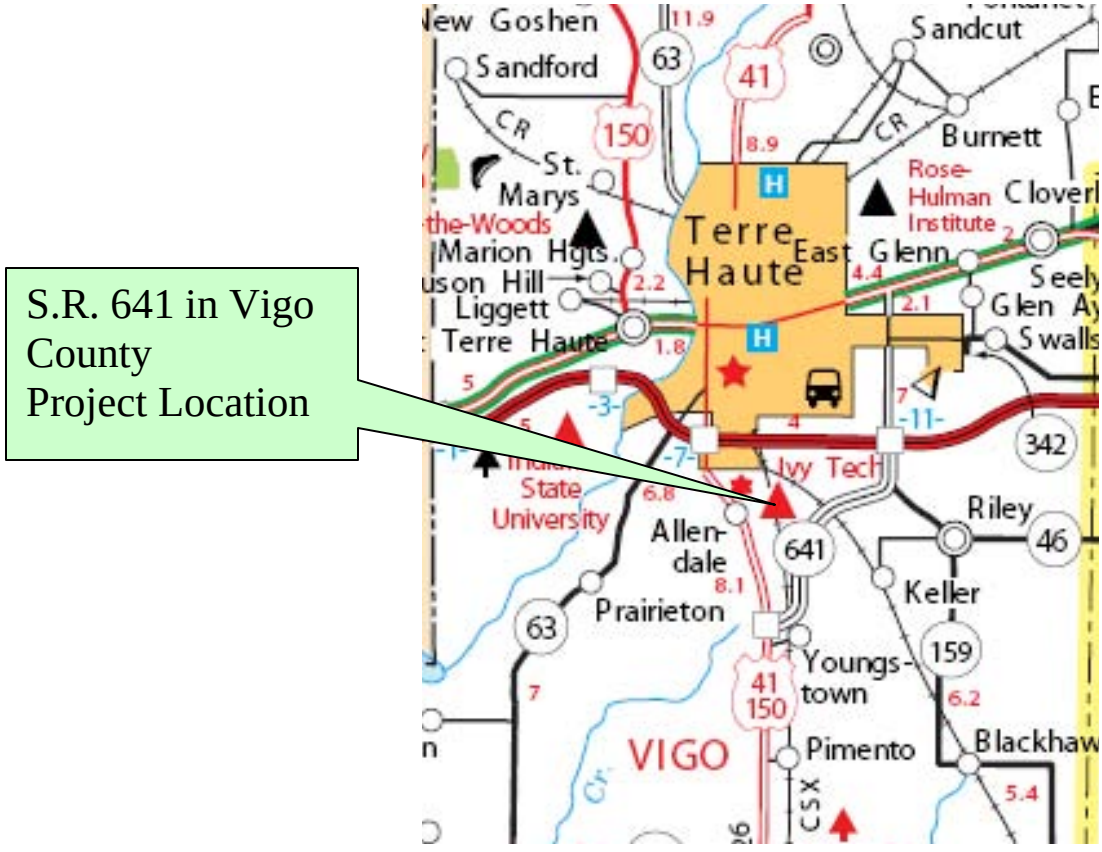
Parties involved: INDOT, Dept. of Commerce, IEUE/Purdue

Type of work: New Roadway Construction: (300 ft long x 275 ft wide by 30 ft high) (Approx)

Coal Ash producer: Wabash River Plan (Cinergy) 65,000 yd³ Approx. 60% to 80% passing 200 Sieve

Geotechnical evaluation: Underway

Environmental evaluation: Underway



S.R. 641 in Vigo County